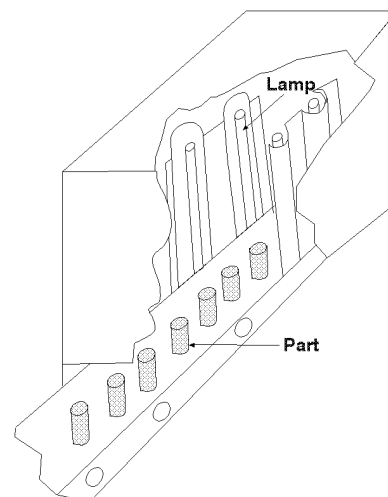


## Applied Technology: Ultraviolet (UV)

### Concept

Ultraviolet radiant curing is an alternative to conventional thermal curing of coatings, inks, and adhesives. Conventional solvent or water based formulations must be first dried (to evaporate the solvent or water), then cured with heat or long exposure to air to convert the soft organic base to a tough polymer. UV-curable formulations contain little or no solvent. The organic base contains a photo-sensitive component ("photoinitiator") that triggers a nearly instantaneous curing reaction upon exposure to ultraviolet light. Thus UV curing produces a completely dry and finished surface in a second or two, compared with minutes or hours for conventional curing. This yields coatings and inks of the highest quality with very high production rates in minimal equipment space.



UV can also disinfect clear or translucent fluids (water, air, etc.) for reuse or recycle.

### Applications

- Curing Coatings, Inks, and Adhesives; metal, wood, plastic, fabrics, mag tape, electronics
- Curing Textile Fiber Sizing
- Compact Disc Production
- Disinfection of Water, Wastewater, Air, and Other Fluids

### Technologies Replaced

- Conventional Thermal Curing; solvent based
- Chemical or Heat Disinfection of Some Fluids

### Wastes Reduced

- Combustion Pollutants: ROG, COx, SOx, NOx, Particulate
- VOC Emissions; from solvents
- Coating Overspray (can be recycled)
- Waste Heat (curing ovens)
- Sludge, Chemicals, and Emissions from Chemically Treated Waters and Wastewaters

### Potential in Manufacturing

<i>Indust</i>	<i>SIC</i>	<i>Pot</i>	<i>Indust</i>	<i>SIC</i>	<i>Pot</i>	<i>Indust</i>	<i>SIC</i>	<i>Pot</i>	<i>Indust</i>	<i>SIC</i>	<i>Pot</i>	<i>Indust</i>	<i>SIC</i>	<i>Pot</i>
Food	20	LOW	Lumber	24	MED	Chem	28	LOW	Stone	32	MED	Elect	36	HI
Tobac	21	LOW	Furn	25	HI	Petrol	29	LOW	Pmetal	33	LOW	Transp	37	HI
Textile	22	MED	Paper	26	MED	Rubber	30	MED	MetFab	34	HI	Instr	38	HI
Apparel	23	LOW	Printing	27	HI	Leather	31	LOW	Mach	35	HI	Misc	39	MED

Credits: : Dr. Philip Schmidt and Dr. F.T. Sparrow;  
Unimar Group, Ltd; The Electrification Council; Electric Power Research Institute

## Ultraviolet (UV) *continued*

### Technology Advantages

- Cures Fast
- Reduces or Eliminates Solvents
- No Curing Ovens
- Can Coat Heat Sensitive Substrates (plastic and wood)
- Less Coating Materials Required
- Small Equipment and Staging Area Required
- Improves Coating Quality
- Aids VOC Regulatory Compliance

### Technology Disadvantages

- Higher Cost of UV Materials
- Some UV Materials Require Special Care (toxic)
- More Worker Protection Required (high energy UV)  
Line of Sight Limitation

### Typical Costs

#### Capital Costs

low; curing units < 1/2 thermal curing ovens; control required little or no emission control required

#### O & M Costs

energy cost: 1/3 - 1/2 of thermal oven  
labor cost: 1/3  
floor space: 1/10  
material: same  
cost/unit area covered

#### Potential Payback

< 1 year or more; application dependent

### Installations

**Case A** - A major brewing company implemented a UV curing process for coating 15 million cans per day. Wet UV curable inks are applied to the cans followed by a clear overvarnish to give the can a high gloss and abrasion-resistant surface. The entire ink/overcoat system is cured in about 1/2 second. The system uses less than 10% of the energy required by a conventional thermal curing oven (not even counting emission controls not needed) and occupies 1/5 of the space. Further energy, space and cost savings accrue from increased production rates and elimination of the solvent vapor incinerator required to meet tough new emission standards.

**Case B** - A printing company is using UV curing on a print line to produce labels, coupons, and tags. UV-curable inks and overprint varnish maintain high quality and consistency in the colors and give the product an attractive and durable finish. Print quality variations due to evaporation of solvent in ink trays have been eliminated. Line speed is about 67% higher for the UV-cured lines. Startup and shutdown/cleanup times have been reduced dramatically with the UV inks. Rejects and product loss at startup have also been sharply reduced.



## Major Vendors

### UV

#### **Crown Metro**

*(coatings)*

P.O. Box 5857  
Greenville, SC 29606  
(803) 299-1331

#### **Eye Ultraviolet**

*(equipment)*

42 Industrial Way  
Wilmington, MA 01887  
(508) 694-9060

#### **Fusion UV Systems**

910 Clopper Road  
Gaithersburg, MD 20878  
(301) 527-2660

#### **Industrial Heating and Finishing Co., Inc.**

*(equipment)*

P.O. Box 129  
Pelham Industrial Park  
Pelham, AL 35142  
(205) 663-9595

#### **Hanovia, Inc.**

*(equipment)*

100 Chestnut Street  
Newark, NJ 07105  
(800) 229-3666

#### **RPC Industries**

*(electron beam equipment)*

21325 Cabot Blvd.  
Hayward, CA 94545  
(510) 785-8040

#### **Specialty Coating Systems**

5707 West Minnesota Street  
Indianapolis, IN 46241  
(800) 356-8260

#### **Sun Chemicals**

*(coatings, inks)*

135 West Lake Street  
Northlake, IL 60164  
(800) 933-7863

#### **UCB Chemical Corporation**

*(coatings)*

Radcure Business Unit  
2000 Lake Park Drive  
Smyrna, GA 30080  
(770) 434-6188

*This list of vendors of the indicated technology is not meant to be a complete or comprehensive listing. Mention of any product, process, service, or vendor in this publication is solely for educational purposes and should not be regarded as an endorsement by the authors or publishers.*

## **Index to EPRI DOCUMENTS**

### **Ultraviolet Curing**

*Ultraviolet Curing Technology*, EPRI CMF TechCommentary, Vol 4, No 4R, 1994

*UV Curing of Coatings on Metals*, EPRI CMF TechApplication, Vol 1, No 16, 1991

*UV Curing in the Label Industry*, EPRI CMF TechApplication, Vol 1, No 17, 1987

*UV Coatings on Wood Shelving*, EPRI TechApplication, TA-106694, 1996

*UVGI for Air Disinfection in a Medical Facility*, EPRI TechApplication, TA-107115, 1996

*UVGI for Infection Control in Hospitals*, EPRI TechApplication, TA-106887, 1996

*Most of the above references are copyrighted and are available from the  
Electric Power Research Institute at a nominal cost.  
Call 1-800-432-0267.*

This information is designed to help you determine **potential** applications for the technology. You are encouraged to contact one of the listed vendors or a consultant for details and pricing.

This manual is not intended as a recommendation of any particular technology, process, or method. Mention of trade names, vendors, or commercial products do not constitute endorsement or recommendation for use. It is offered for educational and informational purposes and is advisory only.

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